

## Warrior X

o sectoring

Part No: PA.740.A

#### Description

Warrior X Wideband Antenna for LTE & FR1 5G NR Bands (698-4900MHz)

PR-TAP. Prosts

#### Features:

High Efficiency Wideband Antenna Covering FR1 5GNR Bands for China Surface Mount Distribution Dimensions: 40 x 5 x 6mm Manufactured in an IATF16949 Certified Facilit<sup>®</sup> RoHS & REACH Compliant



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Changelog

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## Introduction



The Taoglas, Warrior X PA.740.A is a patent pending, high-efficiency, wideband SMD ceramic antenna, designed to cover worldwide LTE bands and FR1 5G NR bands for China (4800~4900MHz). It uses high grade custom ceramic material and new design techniques to deliver the highest efficiencies on all bands when mounted on the device's main PCB. The PA.740 is backward compatible for global 3G/2G applications. The PA.740 is delivered on tape and reel and mounted securely during the device PCB reflow process. The PA.740 also operates with great efficiency on worldwide NB-IoT and CAT-M frequency bands.

Typical applications include:

- Transportation Robotics Wearables
- Autonomous/UAVs Industrial IoT

The PA.740 is more resistant to detuning compared to other antenna integrations. If tuning is required it can be tuned for the device environment using a matching circuit, or other techniques on the main PCB itself. There is no need for new tooling, thereby saving money if customization is required. The Material is highly reliable and robust, the PA.710.A, on which this antenna's design is based, is currently used by world leading automotive manufacturers in extremely challenging environments. The PA.740 has a small profile, 40\*6\*5mm, allows for ease of integration.

Contact your regional Taoglas customer support team to request these services or additional support to integrate and test this antenna's performance in your device.



# Specification

2.

| LTE Electrical                                       |                    |                |                      |                 |           |              |                      |                  |
|--|--------------------|----------------|----------------------|-----------------|-----------|--------------|----------------------|------------------|
| Band   | Frequency<br>(MHz) | Efficiency (%) | Average Gain<br>(dB) | Peak Gain (dBi) | Impedance | Polarization | Radiation<br>Pattern | Max. input power |
| 5GNR/4G<br>Band71                                    | 617-698            | 15.6           | -8.06                | -3.78           |           |              |                      |                  |
| <b>4G/3G</b><br>Band 12,13,14,17,28,29               | 698-824            | 32.6           | -4.86                | 0.77            |           | 50 Ω Linear  | Omni                 |                  |
| 4G/3G/NB-IoT/Cat M<br>Band<br>5,8,18,19,20,26,27     | 824-960            | 54.0           | -2.68                | 2.05            | 50 Ω      |              |                      |                  |
| 5GNR/4G<br>Band 21,32,74,75,76                       | 1427-1518          | 17.8           | -7.49                | -1.59           |           |              |                      |                  |
| <b>4G/3G</b><br>Band<br>1,2,3,4,9,23,25,35,39,6<br>6 | 1710-2200          | 66.7           | -1.76                | 5.17            |           |              |                      | 10W              |
| <b>4G/3G</b><br>Band 7,30,38,40,41                   | 2300-2690          | 62.8           | -2.02                | 4.93            |           |              |                      |                  |
| LTE5200/Wi-Fi5800                                    | 5150-5925          | 52.0           | -2.84                | 4.70            |           |              |                      |                  |
| 5GNR/4G<br>Band 22, 42, 48, 77, 78, 79               | 3300-5000          | 66.9           | -1.74                | 5.69            |           |              |                      |                  |

| Mechanical  |                            |  |
|-------------|----------------------------|--|
| Material    | Ceramic                    |  |
| Dimensions  | 40 x 6 x 5mm               |  |
| Termination | Ag (environmental Pb free) |  |
| Weight      | Зg                         |  |

| Environmental         |               |  |
|-----------------------|---------------|--|
| Operation Temperature | -40°C to 85°C |  |
| Storage Temperature   | -40°C to 85°C |  |
| Moisture Sensitivity  | Level 3       |  |







## 4. Packaging













VNA Test Set-up





















6.





Chamber Test Set-up







6.2



## 6.3 Patterns at 760 MHz















## 6.5 Patterns at 1470 MHz







## 6.6 Patterns at 1955 MHz















## 6.8 Patterns at 4150 MHz







### 6.9 Patterns at 5535 MHz









## Antenna Integration Guide

The following is an example on how to integrate the PA.740.A into a design. This antenna has 4 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 117x40mm ground plane (PCB) to ensure optimal performance.



Please find the Integration files in Altium, 2D formats and the 3D model for the PA.740.A here: https://www.taoglas.com/product/pa-740-a-wideband-5g-nr-4g-3g-2g-smd-pifa-lte-antenna/



## 7.1 Schematic Symbol and Pin Definitions



Above is a 3D model of the PA.740.A on a PCB.

| TA<br>AN | DGLAS_PA.740<br>Tl | A |
|----------|--------------------|---|
|          | NC                 |   |
|          | AEC J              |   |
|          |                    |   |
| 1        | 0 m 4              |   |

| Pin | Description                  |
|-----|------------------------------|
| 1   | RF Feed                      |
| 2   | Ground                       |
| 3,4 | Mechanical, Not<br>Connected |

The circuit symbol for the PA.740.A is shown above. The antenna has 4 pins as indicated above.



### 7.2 Schematic Layout

Matching components with the PA.740.A are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a "pi" network, for the PA.740.A.



| Designator | Туре      | Value      | Manufacturer | Manufacturer Part Number |
|------------|-----------|------------|--------------|--------------------------|
| C1, C2     | Capacitor | Not Fitted | -            | -                        |
| R1         | Resistor  | 0 Ohm      | Murata       | RC0402JR-070RL           |













## 7.5 Top Solder Paste









### 7.7 Copper Clearance for PA.740.A

The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the PA.740.A clearance area. The copper keep out area applies to all layers that are below the PA.740.A.

The copper clearance area should extend to 5mm from the antenna pads to the ground plane. The PCB edge clearance should be 2mm.





#### 7.8 Antenna Integration

The PA.740.A should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A "pi" Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the transmission line and the copper clearance area.



PA.740.A antenna mounted on a PCB, showing the transmission line and integration notes.



## 7.9 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 117x45mm ground plane (PCB) to ensure optimal performance.





8.

The PA.740.A can be assembled by following the recommended soldering temperatures are as follows:



Smaller components are typically mounted on the first pass, however, we do advise mounting the PA.740.A when placing larger components on the board during subsequent reflows.

Note: Soldering flux classified ROLO under IPC J-STD-004 is recommended.

SPE-19-8-089-E



| Changelog for the datasheet |                        |  |  |  |
|-----------------------------|------------------------|--|--|--|
| SPE-19-8-089 -PA.740.A      |                        |  |  |  |
| Revision: F (Current        | Version)               |  |  |  |
| Revision. E (Current        | versiony               |  |  |  |
| Date:                       | 2025-04-28             |  |  |  |
| Changes:                    | Full datasheet update. |  |  |  |
| Changes Made by:            | Cesar Sousa            |  |  |  |
|                             |                        |  |  |  |

#### **Previous Revisions**

| Revision: D      |                                   |  |
|------------------|-----------------------------------|--|
| Date: 2023-10-24 |                                   |  |
| Changes:         | Updated the Solder Reflow Profile |  |
| Changes Made by: | Cesar Sousa                       |  |

| Revision: C      |                                 |  |
|------------------|---------------------------------|--|
| Date:            | 2023-03-13                      |  |
| Changes:         | Antenna Integration Guide Added |  |
| Changes Made by: | Cesar Sousa                     |  |

| Revision: B      |                              |  |  |
|------------------|------------------------------|--|--|
| Date:            | 2020-11-05                   |  |  |
| Changes:         | Specifications table amended |  |  |
| Changes Made by: | Dan Cantwell                 |  |  |

| Revision: A (Original First Release) |             |  |
|--------------------------------------|-------------|--|
| Date:                                | 2019-06-24  |  |
| Notes:                               |             |  |
| Author:                              | Jack Conroy |  |





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